

Appl. No. : 09/511,934
Filed : February 24, 2000

REMARKS

Claim 1 has been amended to clarify the invention. Support for the amendment can be found in the paragraph beginning at page 14, line 7, and the first paragraph of page 4, for example. Claim 21 has been added. No new matter has been added. Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE." Applicants respectfully request entry of the amendments and consider the application in view of the amendments and the following remarks.

Rejection of Claims 1-10 Under 35 U.S.C. § 103

Claims 1 and 4-10 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Frankel in view of Kao. However, a combination of Frankel and Kao could not lead to the claims as amended herein as explained below.

The Examiner asserts "*Kao et al introduction of inert gas prior to introduction of reactive cleaning gas (Abstract and Col 11 lines 53-60) and both Frankel and Kao disclose a preferred temperature range of pedestal during the cleaning process to 400°-700°C (Kao- Col 17-lines 59-63 and Frankel- Col 54 lines 67 to Col 55 line 1).*"

However, Kao does not teach introducing inert gas while reducing the temperature of a susceptor. In Kao, the temperature is not lowered (column 17, lines 62-64). Frankel makes no mention of introduction of inert gas coupled with a cleaning process.

Further, Kao discloses the temperature range of 400°C-700°C and the most preferable temperature of 550°C, but Kao does not concern adverse effects of cleaning, i.e., accumulation of particles on a showerhead during a cleaning process. Frankel discloses the temperature range of 300°C-650°C and the preferably range of 550°C-600°C. Frankel mentions generally a contamination problem, but Frankel's solution is simply the use of aluminum nitride, and nothing else is considered (column 31, lines 65-67). Thus, the claimed range "about 470°C or lower" for preventing accumulation of particles on a showerhead could not be obvious. M.P.E.P. 2144.05 III states:

"Applicant can rebut a *prima facie* case of obviousness based on overlapping ranges by showing the criticality of the claimed range. '... In such a situation, the applicant must show that the

particular range is critical, generally by showing that claimed range achieves unexpected results relative to the prior art range.' *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990)."

In the present case, the criticality of the claimed range is shown in the attached Declaration. See ¶¶3-9. In the Declaration, the photographs in ¶5 are not clear (because the Declaration is a faxed copy), and it is difficult to examine these photographs. For the Examiner's reference, the following photographs identical to those in the Declaration are pasted herein.

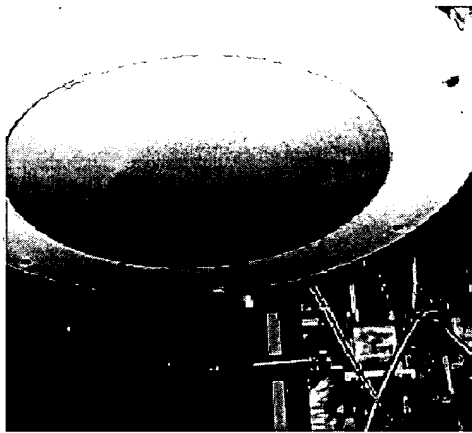


Fig.1- 1 ヒーター温度 600°C

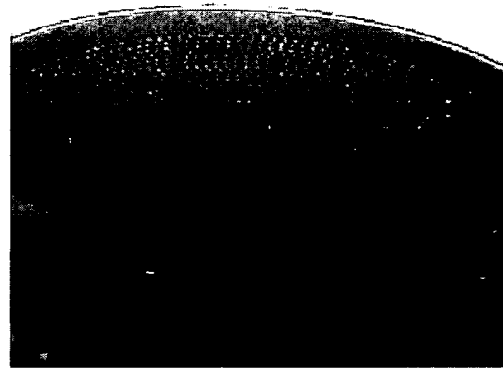


Fig.1- 2 ヒーター温度 500°C



Fig.1- 3 ヒーター温度 470°C

Fig.1 各ヒーター温度でのクリーニング加速試験後のシャワープレート表面の写真

By conducting cleaning at a temperature of about 470°C or lower, accumulation of particles on a showerhead can significantly and surprisingly be prevented. As a result, films can be produced without changing the thickness of films and the stress of films. The showerhead need not

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be physically cleaned often. These remarkable effects cannot be expected from the teachings of Kao or Frankel or a combination thereof. Thus, Claim 1 as amended herein could not be obvious over Kao and Frankel. At least for this reason, the dependent claims also could not be obvious over these references. Applicant respectfully requests withdrawal of this rejection.

New Claim 21

Claim 21 has been added, which includes the above-described features. Thus, as with Claim 1, this claim could not be obvious over the prior art.

CONCLUSION

In light of the Applicants' foregoing Remarks, it is respectfully submitted that the present application is in condition for allowance. Should the Examiner have any remaining concerns which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below. Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: March 20, 2003

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claim 1 has been amended as follows:

1. (Fifth amended) A thin film forming apparatus comprising:

a reaction chamber for forming at a film formation temperature of 500°C or higher a thin film on a workpiece placed on a susceptor and below a showerhead provided in the reaction chamber, said susceptor being made of aluminum nitride and provided with a heater for heating the workpiece, said reaction chamber being provided with a conveyer for loading and unloading the workpiece into and from the reaction chamber; and

a cleaning device for cleaning unwanted deposits adhering to the inside of the reaction chamber at predetermined intervals, said cleaning device comprising:

(i) a cleaning gas controller for introducing a cleaning gas into the reaction chamber and evacuating the reaction chamber after the cleaning treatment;

(ii) a cleaning gas activator for activating the cleaning gas in radical form; and

(iii) a temperature and timing controller comprising a program including a cleaning sequence which is activated after completion of film formation, said cleaning sequence programmed to (1) introduce an inert gas to the reaction chamber ~~to obtain a predetermined pressure~~during step (2), (2) reduce the temperature of the susceptor to a cleaning temperature at a predetermined rate for cleaning, at the predetermined pressure by the inert gas, wherein the cleaning temperature settings are limited to about 470°C or lower, (3) when reaching a cleaning temperature of about 470°C or lower which is ~~lower than the film formation temperature~~pre-selected for preventing accumulation of particles on the showerhead during the cleaning process, actuate the cleaning gas controller and the cleaning gas activator, and (4) evacuate the reaction chamber.

Claim 8 has been canceled.